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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/055,270	01/22/2002	Jae-Hyun Joo	9898-217	6757

7590 05/17/2002

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EXAMINER
MAI, ANH D

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 05/17/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/055,270	Applicant(s) JOO ET AL.	
	Examiner Anh D. Mai	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 January 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Pri rity under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

1. Claims 1-6, 8-17, 19-23 and 27 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Agarwal et al. (U.S. Pub No. 2002/0037630).

With respect to claim 1 and 13, Agarwal teaches a method of fabricating a semiconductor device as claimed including:

forming a lower electrode (12) on a substrate (10);

subjecting the lower electrode (12) to a pre-annealing, wherein the pre-annealing is a thermal annealing under a selected atmosphere or a plasma atmosphere;

forming a capacitor dielectric layer (28) on the lower electrode (12);

forming an upper electrode (30) on the capacitor dielectric layer (28). (See Figs. 1-7).

With respect to claim 2, the lower electrode (12) of Agarwal is formed of a metal.

With respect to claims 3, 4, 14 and 15, the lower electrode (12) of Agarwal is formed by a CVD method using metal organic material.

With respect to claims 5, 16 and 22, the capacitor dielectric layer (28) of Agarwal is annealed following the deposition, thus, crystalline material.

With respect to claims 6, 17 and 23, the pre-annealing of Agarwal does not substantially change the materiality of the lower electrode (12).

With respect to claim 8, the pre-annealing of Agarwal is performed at a temperature that overlaps the claimed range.

With respect to claims 9 and 19, the selected atmosphere or plasma atmosphere of Agarwal comprises hydrogen gas.

With respect to claim 10, the selected atmosphere of Agarwal comprises nitrogen gas.

With respect to claims 11 and 12, the selected atmosphere of Agarwal is a mixed atmosphere comprises hydrogen and nitrogen.

With respect to claim 20, see claims 2 and 3 above.

With respect to claim 21, the pre-annealing of Agarwal is one selected from the group as claimed.

With respect to claim 27, the selected atmosphere of Agarwal comprises a gas and at a temperature that includes the claimed range.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 7, 18, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal '630 as applied to claims 1, 13 and 21 above, and further in view of Aoki et al. (U.S. Patent No. 6,303,952).

With respect to claims 7, 18 and 24, Agarwal further teaches that the capacitor dielectric layer (28) is annealed, thus crystallized.

Thus, Agarwal is shown to teach all the features of the claim with the exception of explicitly disclosing the temperature of the anneal.

However, Aoki teaches the capacitor dielectric layer (20/324) is subjected to a well known crystallizing temperature following the deposition.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to crystallize the capacitor dielectric layer (28) of Agarwal under a crystallizing temperature as taught by Aoki to reduce leakage currents.

Further, the pre-annealing temperature of Agarwal is performed at up to 900 °C, thus higher than that of the crystallization annealing.

With respect to claim 25, the crystallization temperature of Aoki is similar to that of the claim.

3. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal '630.

Agarwal teaches subjecting the metal lower electrode (12) to a pre-annealing in selected atmosphere comprises hydrogen gas (reducing ambient) at a temperature that higher than the claimed range. The claimed temperature range does not appear to be critical.

However, Agarwal also teaches that the temperature required for the pre-annealing process may be reduced if reducing ambient is used.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to reduce the pre-annealing temperature of Agarwal since the reducing ambient is used.

Further, within purview of one having ordinary skill in the art at the time of invention, it would have been obvious to determine the optimum pre-annealing temperature in reducing ambient to treat the lower electrode. See In re Aller, Lacey and Hall (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation".

4. Claims 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal '630 as applied to claim 21 above, and further in view of Narwanka et al. (U.S. Patent No. 6,204,203).

Agarwal teaches subjecting the metal lower electrode (12) to a pre-annealing temperature in selected atmosphere comprises a nitrogen and hydrogen mixed atmosphere.

Thus, Agarwal is shown to teach all the features of the claim with the exception of explicitly disclosing the ratio of the gases used.

However, Narwanka teaches that a forming gas mixture of H_2/N_2 having a ratio of 1-10% by volume are well known in the art to be used to thermally treat the lower electrode.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to perform the pre-anneal treatment of the lower electrode (12) of Agarwal using the forming gas ratio as taught by Narwanka to passivate the lower electrode.

With respect to claim 29, a reason similar to that of claim 26 also applied.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (703) 305-0575. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A.M
May 7, 2002

OLIK CHAUDHURI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800